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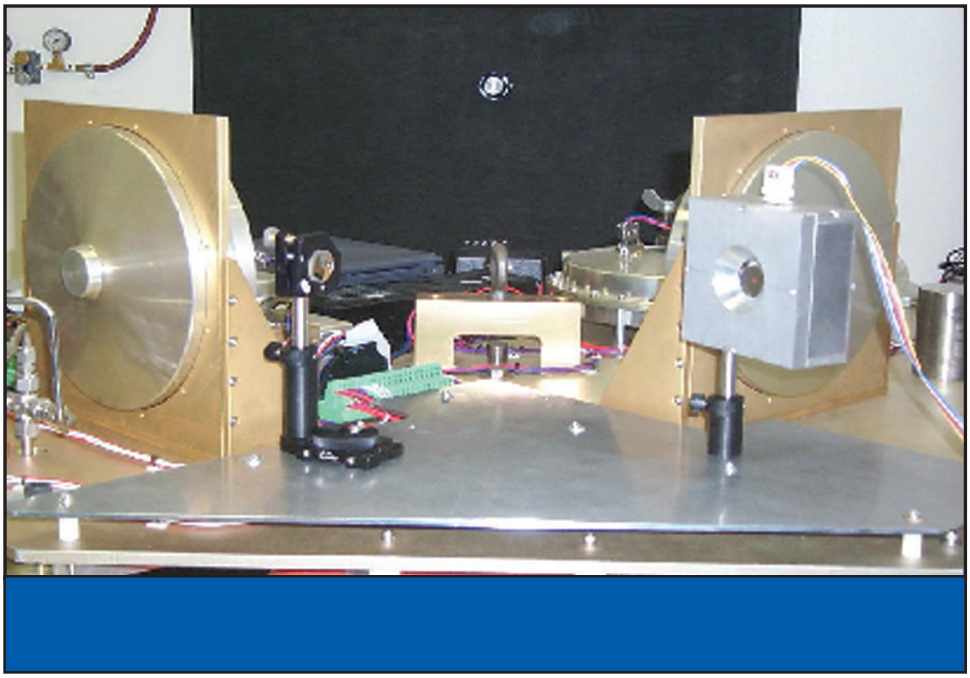
Science and Technology for Tomorrow's Aerospace Forces

Success Story

RELAY MIRROR TECHNOLOGY DEVELOPMENT



A relay mirror system has several potential military applications for directed energy. It is the critical element in many future Air Force space-related missions. It will provide a global infrastructure for force projection, information dominance, and force enhancement missions. Identifying and integrating the necessary control systems for the opto-mechanical control of satellites is a crucial step in technological advancement for relay mirrors and other space-based optical platforms. The Directed Energy Directorate and Naval Postgraduate School (NPS) worked together to enable future systems with large optics and the necessary controls to meet the stringent requirements of future space-based tactical weapons systems.

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Accomplishment

The directorate and NPS teamed together to create a robust demonstration coupling optical control and attitude control of a satellite. Recently, directorate personnel built the optical system and set it up at the NPS facility.

The NPS built a satellite control test bed with three reaction wheels to simulate attitude control in space. In 2001, the team demonstrated beam stability, acquisition, and tracking of a cooperative target on a stable satellite test bed and continued their effort in demonstrating the same beam control while "floating" the satellite test bed.

Background

The relay mirror system will require many subsystems and many levels of control. The proposed bifocal design, consisting of two symmetric, optically linked telescopes, poses many challenges for basic satellite dynamics and control. Also stringent requirements exist for slewing and tracking that make satellite control a major challenge for relay mirror development.

The directorate teamed with the NPS to help resolve some of these technical challenges. The approach is to develop theoretical models of both the attitude control system and the optical control system, demonstrate them separately in the lab, and then integrate them. This control integration is key in tackling momentum and attitude.

Directed Energy
Technology Transfer

Additional information

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